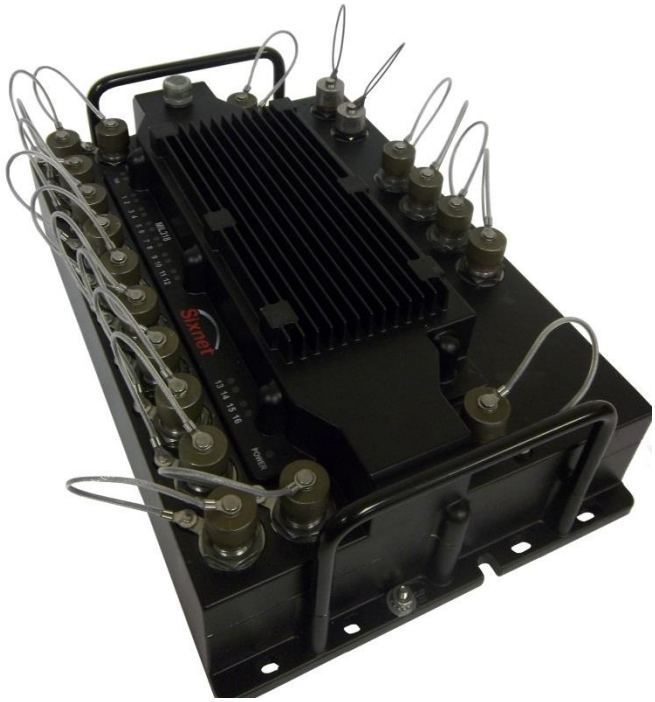
USER MANUAL

18-Port Gigabit IP67 Layer 3 Ethernet Switch



Installation and Wiring Manual

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This manual applies to the following products:

- **MIL318-xxxx-yy** IP67 managed Layer 3 Ethernet switch with 12 copper Gigabit ports, 4 additional copper or fiber Gigabit ports, and two 10 Gigabit fiber ports

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Red Lion Protected Technology Policy - Red Lion protects your investment in Red Lion systems with long-term planned technology and our unique Protected Technology Policy. We will continue to support the specified capabilities of standard Red Lion products for at least five years (twenty years for Industrial Managed Switches). We plan each product improvement and new feature to be upward compatible with existing designs and installations. Our goals are to make each new software release bring new power to your Red Lion systems and have every existing feature, applications program and data file continue to work. We protect your investment even further with a liberal five-year trade-in policy. Exchange standard products for upgraded versions of the same product to take advantage of new features and improvements at any time for five years. A prorated trade-in allowance will be given for your existing unit. Red Lion protects your long-term productivity with state-of-the-art planned technology and continued support.

Red Lion Statement of Limited Warranty - Red Lion, manufacturer of Red Lion products, warrants to Buyer that products, except software, manufactured by Red Lion will be free from defects in material and workmanship. Red Lion's obligation under this warranty will be limited to repairing or replacing, at Red Lion's option, the defective parts within one year of the date of installation, or within 60 months of the date of shipment from the point of manufacture, whichever is sooner. Products may be returned by Buyer only after permission has been obtained from Red Lion. Buyer will prepay all freight charges to return any products to the repair facility designated by Red Lion. This limited warranty does not cover losses or damages which occur in shipment to or from Buyer or due to improper installation, maintenance, misuse, neglect or any cause other than ordinary commercial or industrial applications. In particular, Red Lion makes no warranties whatsoever with respect to implied warranties of merchantability or fitness for any particular purpose. All such warranties are hereby expressly disclaimed. No oral or written information or advice given by Red Lion or Red Lion's representative shall create a warranty or in any way increase the scope of this warranty. This limited warranty is in lieu of all other warranties whether oral or written, expressed or implied. Red Lion's liability shall not exceed the price of the individual units, which are the basis of the claim. In no event shall Red Lion be liable for any loss of profits, loss of use of facilities or equipment, or other indirect, incidental or consequential damages.

INSTALLATION WARNINGS - These products should not be used to replace proper safety interlocking. No software-based device (or any other solid-state device) should ever be designed to be responsible for the maintenance of consequential equipment or personnel safety. In particular, Red Lion disclaims any responsibility for damages, either direct or consequential, that result from the use of this equipment in any application. All power, input and output (I/O) wiring must be in accordance with Class I, Division 2 wiring methods and in accordance with the authority having jurisdiction. Refer to section 1 for other important installation warnings.

FCC Statement - This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures: Reorient or relocate the receiving antenna; Increase the separation between the equipment and receiver; Connect the equipment into an outlet on a circuit different from that to which the receiver is connected; Consult the dealer or an experienced radio/TV technician for help.

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Note: All information in this document is subject to change without notice.

Section 1 General Specifications

Overview

The Red Lion MIL318-xxxx-yy is an 18 port industrial Ethernet managed switch designed to meet the extreme requirements found in the toughest applications. It combines the high performance and security of an enterprise-class switch with rugged packaging and protected circuitry to meet the needs of the most demanding applications.

This manual will help you install and maintain these industrial Ethernet switches. Installation of these switches is very easy and they will begin to operate as soon as they are powered up. Though these are fully managed switches, they will act as unmanaged until they are configured otherwise. Refer to the separate software manual or management guide for configuration of the advanced networking functionality and security.

Note: This manual only covers the installation and wiring of these switches. Refer to the separate Software User Manual for details on configuring and using any of the management functions such as SNMP, RSTP, IGMP, port mirroring, etc.

Basic Operation

Unlike an Ethernet hub that broadcasts all messages out all ports, these industrial Ethernet switches will intelligently route Ethernet messages only out the appropriate port. The major benefits of this are increased bandwidth and speed, reduction or elimination of message collisions, and deterministic performance when tied with real-time systems.

These switches support 10BaseT (10 Mbps), 100BaseT (100 Mbps) and 1000BaseT (1000 Mbps) on 12 ports. Each of these ports independently and automatically senses the speed and duplex for best performance. There are an additional 4 Ethernet ports with fixed 10BaseT speeds and 2 fiber ports (single mode or multimode) with fixed 10GBaseT (10000 Mbps) speeds. All Gigabit ports offer auto-crossover and auto-polarity to assure a proper link with either straight or crossed wired cables or even when the cable is incorrectly wired.

Performance Specs

The switch has the following performance specifications. Note: All specifications are subject to change. Consult factory for latest information.

ETHERNET PERFORMANCE

- 12 10/100/1000 Ethernet ports
- 4 1000Mbps copper or fiber Ethernet ports (single mode or multimode)
- 2 10000Mbps fiber ports (single mode or multimode)
- Auto-negotiation (speed/duplex) and auto-crossover on Gigabit ports
- Non-blocking, store and forward, wire-speed
- Switching capacity: 128 Gbps/176 Gbps
- Forwarding rate: 95.2 Mpps/130.9 Mpps
- MAC address table size: 16K
- Jumbo frame: 9K
- Ethernet isolation: 1500 Vrms 1 minute
- Connector: MIL-STD-38999 series III receptacle

ETHERNET COMPLIANCE

- IEEE 802.3 (Original Ethernet 10Mbps)
- IEEE 802.3u (Fast Ethernet 100Mbps)
- IEEE 802.3z (Gigabit Ethernet 1000Mbps)
- IEEE 802.3x (Full-Duplex with Flow Control)
- Refer to product data sheet for complete list

POWER INPUT

- Connector: MIL-STD-38999 Series III receptacle with shell size A, style 98, 3 pin contacts and A keying
- Input voltage range: 18-36 VDC (continuos), 28 VDC Nominal
- Input power: 50 W (typical under full load)
- Reverse polarity protection
- Meets MIL-STD-704 and MIL-STD-1275 for power protection
- Surge protection: 100 volts for 1 second
- Transient protection: 15,000 watts peak
- Spike protection: 5,000 watts (10x for 10 uS)
  or 250 volts (50x for 100 uS)

ENVIRONMENTAL

- Operating temperature: -40 to +70°C (cold startup at -5°C)
- Storage temperature: -40 to +85 °C
- Humidity (non-condensing) 5 to 95% RH
- Vibration, shock and Immersion per MIL-STD-810G
- Water Jet Test per MIL-STD-108E
- Vent plug for high altitude operation

PHYSICAL

- Dimensions (L x W x H) 13 x 8.5 x 4.25" (330 x 216 x 108 mm)
- Weight (including caps) 12 lbs (5.44 Kg)
- IP67 dust, oil and water-tight package protection

STANDARDS COMPLIANCE

- MIL-STD-461F for EMI performance. CE101, CE102, RE102
- MIL-STD-461F for EMC performance. CS101, CS114, CS115, CS116, RS101, RS103
- MIL-STD-810G and MIL-STD-108E for environmental performance
- MIL-STD-704 A/E/F and MIL-STD-1275 A/B/D for power protection (Power Input)

SWITCHING FEATURES

- Flow control: IEEE 802.3x (Full Duplex) & Back-Pressure (Half Duplex)
- Spanning Tree Protocol (STP per IEEE 802.1D) plus
  - IEEE 802.1w Rapid Spanning Tree Protocol (RSTP)
  - IEEE 802.1s Multiple Spanning Tree Protocol (MSTP)
  - BPDU forwarding and filtering
- Virtual Local Area Networks (VLANs)
  - 802.1Q tag-based with 256 VLANs and 4K VLAN ID
  - 802.1v protocol and port-based VLAN
  - Voice and Private VLAN
  - QVRP and Q-in-Q (double tagging)
- Link Aggregation Control Protcol (LACP per IEEE 802.3ad)
  - Static trunk (8 trunks and up to 8 ports per trunk)
  - Traffic load balancing
- Internet Group Management Protocol (IGMP)
  - IGMP v1, v2 and v3 with up to 255 multicast groups
  - IGMP snooping and querying
  - Immediate leave and leave proxy
  - Throttling and filtering
- Multicast VLAN Registration (MVR)
- IEEE 802.1ab Link layer Discovery Protocol (LLDP)
- Quality of Service (QoS) with 4 priority queues
  - Scheduling schemes: WRR and Strict priority
  - CoS per IEEE 802.1p and IP DSCP-based
  - DiffServ (DS): ingress, egress and remarking
- Rate limiting (ingress and egress)
  - 64Kbps to 100/1000Mbps
  - Per port CoS

SECURITY

- Enable / disable ports
- Port security (MAC-based): static and dynamic
- DHCP Snooping and Option 82
- IP Source Guard
- IEEE 802.1x Network Access Control
  - Port-based with single or multiple host mode
  - Authentication: EAP-MD5, PEAP, TLS, TTLS
  - MAC and web authentication
  - Guest VLAN and Auto VLAN assignment
- RADIUS and TACACS AAA
  - Authentication, Accounting and Authorization
  - 5 servers for RADIUS, 1 server for TACACS
  - Encryption: MD5, TLS, TTLS, TACACS AAA/3.0
- Access Control List (ACL)
  - IP and MAC-based
  - VLAN and TCP/UDP port
- Storm Control for broadcast and multicast messages
- HTTPS/SSL for secure Web access
- SSH v1.5/2.0 for secure Telnet access
- SNMPv3 authentication and encryption
- Username and password authentication
- Management access filtering

MANAGEMENT AND MONITORING

- RS232 console port via MIL-STD-38999 series III connector w/ shell size A, style 35, 6 contacts & A keying
- IP Address assignment: Static, DHCP and BOOTP
- CLI (Command Line Interface) via console or Telnet
- Web interface (HTTP/HTTPS/SSL)
- SNMP v1, v2, v3 (Simple Network Management Protocol)
- SNMP Traps for event notification
- RMON (Remote Monitoring): Groups 1, 2, 3 and 9
- sFlow network-wide traffic monitoring
- Dual firmware update system
- Configuration download and upload
- Software upgrade via TFTP
- Port mirroring
- Event / Error / System log
  - Local flash
  - Remote server via system log (Syslog RFC 3164)
  - SMTP (RFC 821) email alarming
- Network Time Protocol for time synchronization
  - SNTP (RFC 2030) and NTP (RFC 1305)
- DNS (Domain Name Server) client
- Universal Plug and Play (UPnP)
- IEEE 802.3ah OAM (Operational Administration Maintenance)
  - Banner commands

ROUTING FEATURES

- Host table: 8K
- Route table: 8K
- Static route table: 512
- Multicast table: 1K
- Unicast routing
  - Static unicast routes
  - RIP v1/v2
  - OSPF
  - BGP
- Multicast routing

ROUTING FEATURES (continued)

- PIM-DM
- PIM-SM
- IGMP v1/v2/v3
- IGMP v3 proxy

- IP Redundancy
- Proxy ARP
- UDP Helper

WARRANTY

5 years on design and manufacturing defects

Safety Warnings

Strictly abiding by these warnings will help ensure the safe installation, startup and operation of the switch.

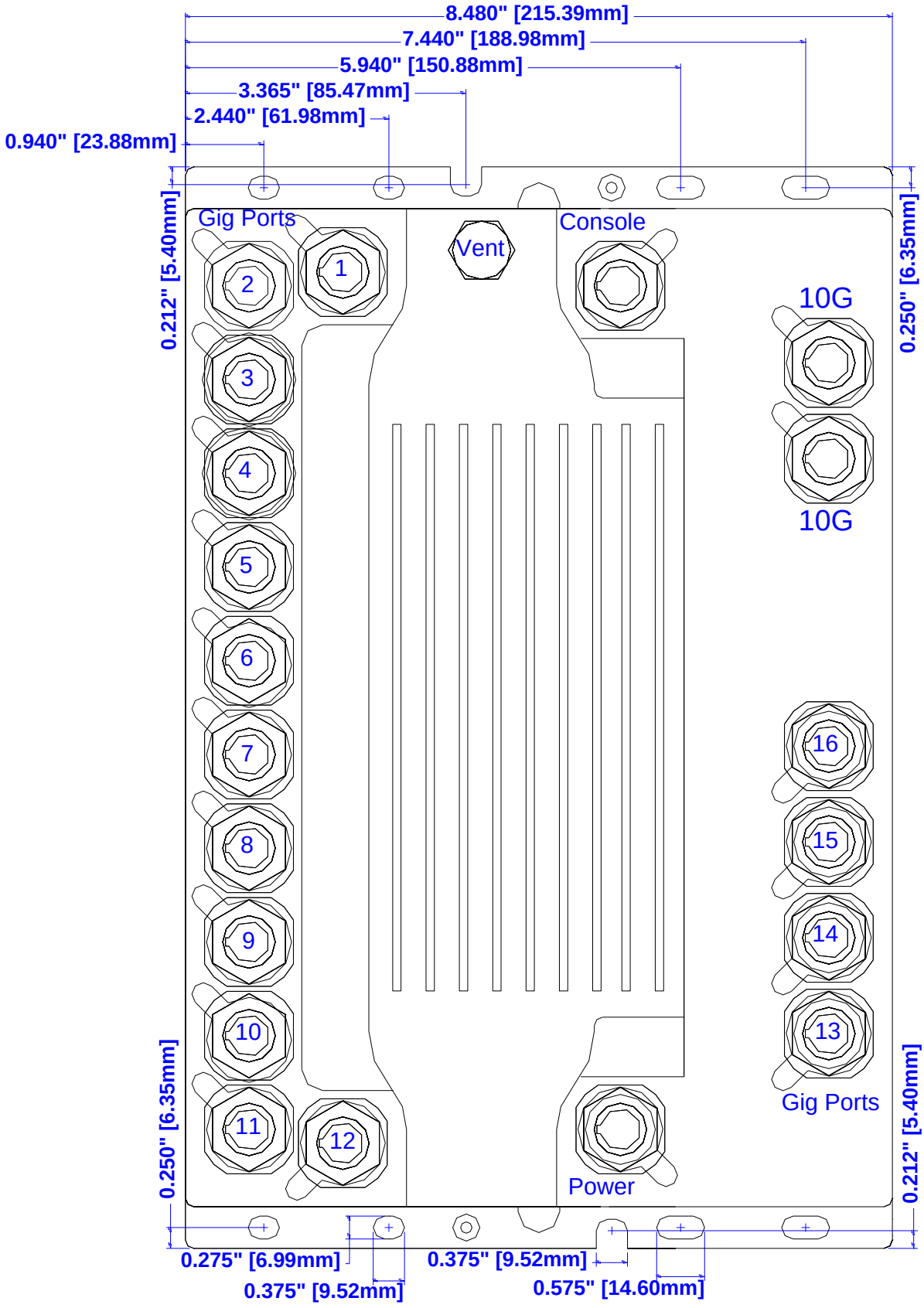
INSTALL THE SWITCH IN ACCORDANCE WITH ALL LOCAL AND NATIONAL ELECTRICAL CODES.

LIGHTNING DANGER: DO NOT WORK ON EQUIPMENT DURING PERIODS OF LIGHTNING ACTIVITY.

Section 2 Mechanical Dimensions and Installation

Overview

The switch is designed to be mounted to any flat surface. It is recommended to use thermal grease or a gap pad between the MIL318 unit and the surface it is mounted on .The MIL318 case is designed to act as a heat sink and this will ensure cooler operation of the unit.



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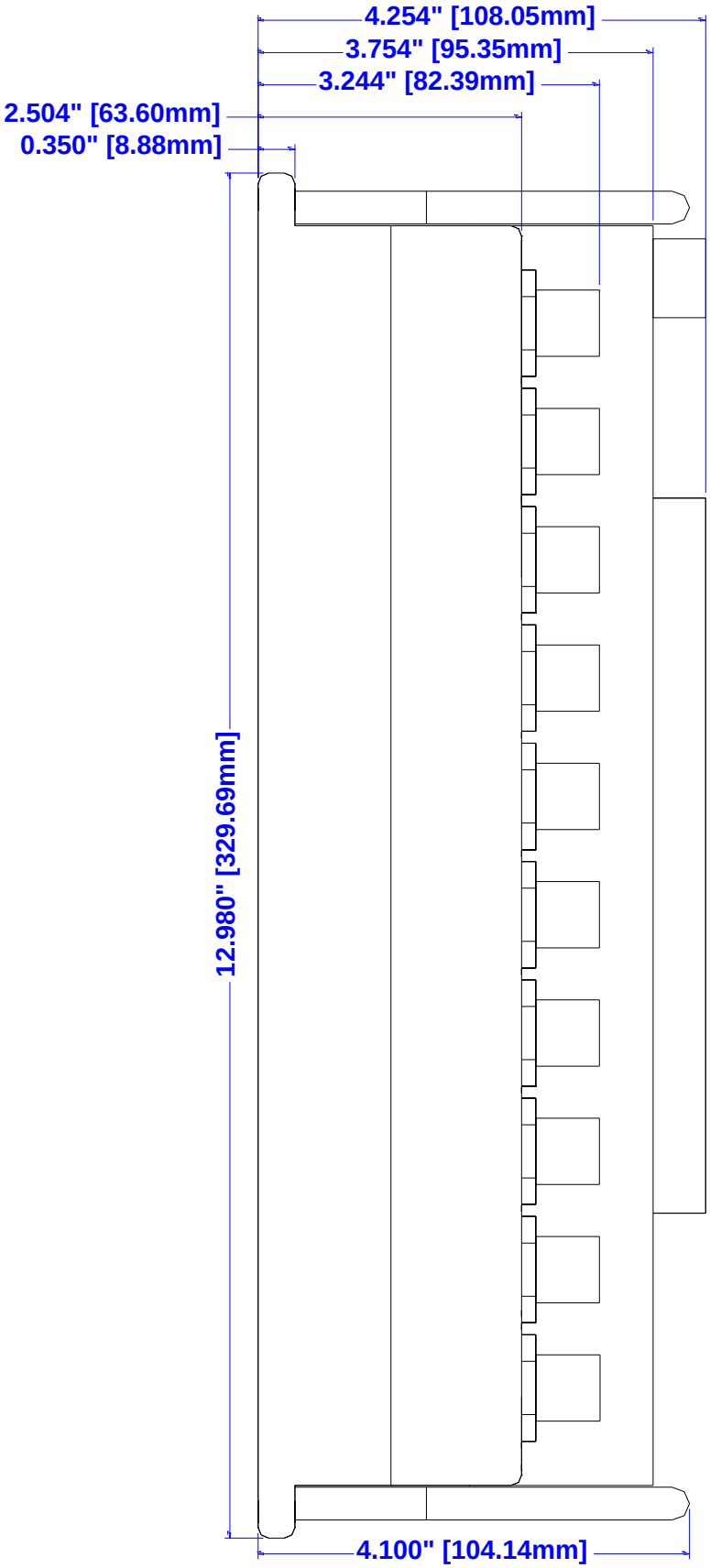

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Section 3 Power and Communication Connections

Overview

The switch features 38999 Series III style connectors which meet or exceed the MIL-STD-38999 standard. All these connectors have EMI shielding, ESD protection, plus moisture and corrosion resistance. All mating connectors will self-lock with one 360 degree turn of the coupling nut.

Typical MIL-STD-38999 Connectors

(shown with tethered dust caps)

Typical MIL-STD-38999 Plug

(not typically supplied with switch)

Grounding

Use the provided 8-32 ground stud to connect the switch to a suitable safety, chassis or earth ground. Use of heavy gauge (at least 16 AWG) grounding wire is recommended. Make sure to follow your local or national codes for the proper ground connection.

Chassis Ground Connection Point

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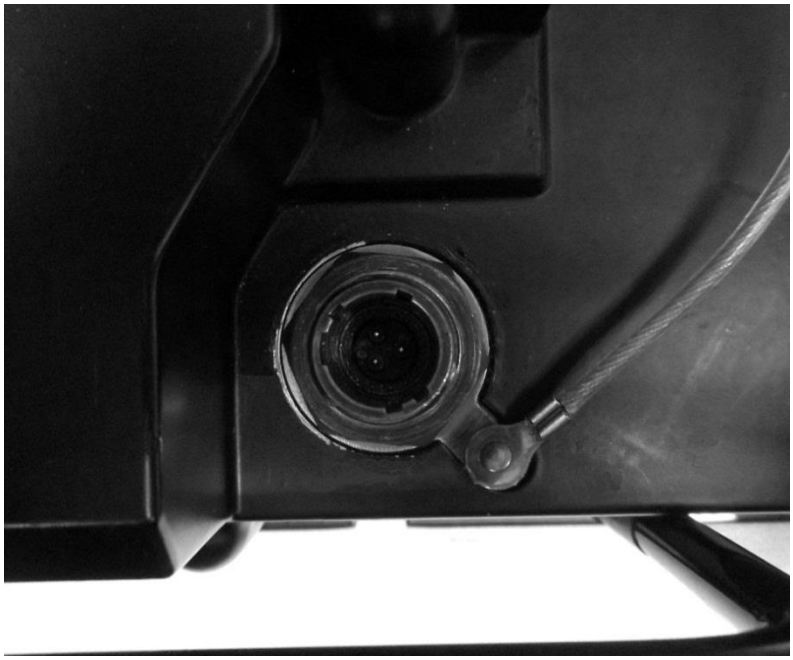
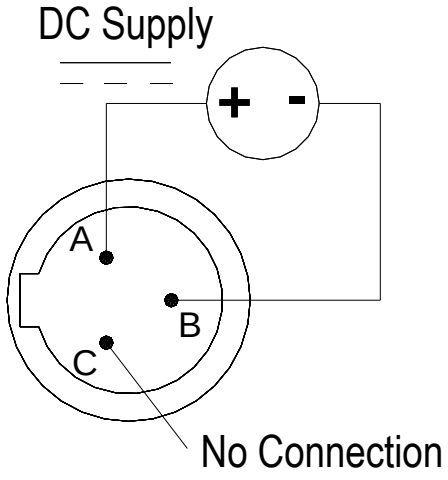
Power Receptacle

The switch requires a nominal voltage of **28 VDC** (18-36 VDC Range). Make the power connections as shown in the diagram below.

Power Receptacle



Power Receptacle Pinout



Receptacle:
Shell=A, Insert=98, Contacts=P, Keying=A

Recommended Plug

Model # **D38999/26WA98SA**
(w/ socket contacts and A keying)

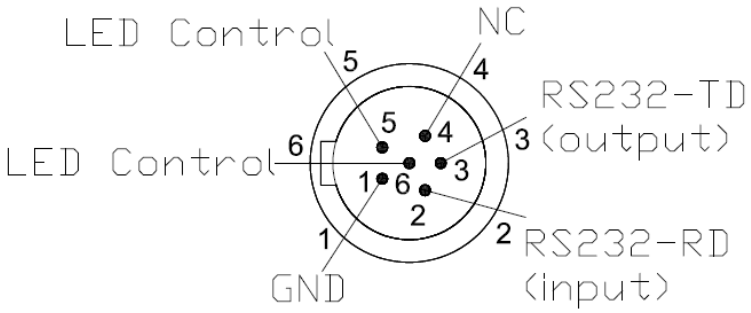
Note: The W in the part # above indicates cadmium plating. However, you may use any plating option that you desire. The mating receptacles on the switch have a RoHS-compliant nickel plating.

Console Receptacle

The switch offers a RS232 serial port for accessing the local management interface. Once you have made a physical connection refer to the software user manual on how to access the switch via this console port.

Console Receptacle

Console Receptacle Pinout



Shell=A, Insert=35, Contacts=P, Keying=A

LED Control

Shorting out pins 5 and 6 on the RS232 connector will turn off all LEDs while continuing regular switch operation. Leave pins 5 and 6 open for normal LED function.

Recommended Plug

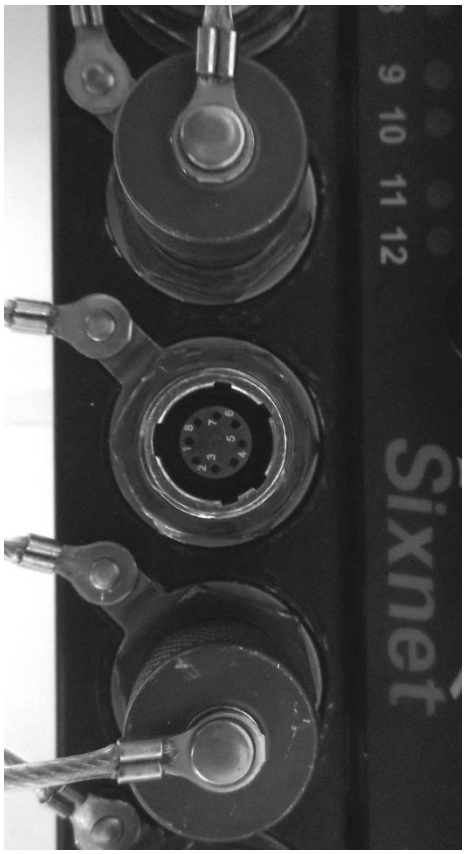
Model # **D38999/26WA35PA**
(w/ pin contacts and A keying)

Note: The W in the part # above indicates cadmium plating. However, you may use any plating option that you desire. The mating receptacles on the switch have a RoHS-compliant nickel plating.

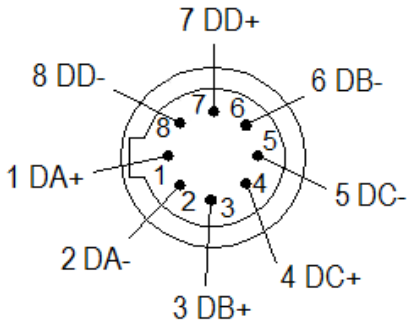
Ethernet Receptacle

The switch has 12 10/100/1000 copper Ethernet ports (1-12). These ports will auto-detect the speed and duplex of the connection. The switch also may have 4 full duplex 1000 Ethernet ports (13-16) which do not have configurable speeds. All ports can be disabled or configured for fixed settings via one of the management interfaces. See the software user manual for details.

Ethernet Receptacle



Ethernet Receptacle Pinout



Receptacle:
Shell-Insert = 9-9, Contacts = S, Keying = N

Typical Pinout Connections

Pin-1 - - - TX + (For 10/100)
Pin-2 - - - TX – (For 10/100)
Pin-3 - - - RX + (For 10/100)
Pin-4 - - - TX + (For Gig)
Pin-5 - - - TX – (For Gig)
Pin-6 - - - RX – (For 10/100)
Pin-7 - - - RX + (For Gig)
Pin-8 - - - RX – (For Gig)

Recommended Plug

Aero # **AE90-365-BN9-9PN**

Note: This plug has a black nickel plating. Contact Aero for other plating options that may be used. The mating receptacles on the switch also have a black nickel plating.

Wiring Standards Table	See chart below

Pin	EIA / TIA 568A	EIA / TIA 568B or AT&T 258A	10Base-T 10 Mbps Cat3	100Base-TX 100 Mbps Cat5	100Base-T4 100 Mbps Cat3	100Base-T2 100 Mbps Cat3	1000Base-T 1 Gbps Cat5+
1	white / green	white / orange	TX+	TX+	TX D1+	BI DA+	BI DA+
2	green / white (green)	orange / white (orange)	TX-	TX-	TX D1-	BI DA-	BI DA-
3	white / orange	white / green	RX+	RX+	RX D2+	BI DB+	BI DB+
4	blue / white (blue)	blue / white (blue)	N/A	N/A	BI D3+	N/A	BI DC+
5	white / blue	white / blue	N/A	N/A	BI D3-	N/A	BI DC-
6	orange / white (orange)	green / white (green)	RX-	RX-	RX D2-	BI DB-	BI DB-
7	white / brown	white / brown	N/A	N/A	BI D4+	N/A	BI DD+
8	brown / white (brown)	brown / white (brown)	N/A	N/A	BI D4-	N/A	BI DD -

BI=BI directional data RX=Receive Data TX=Transmit Data

(Pair Colors may be solid and striped/color, or color with white stripe and white with color stripe)

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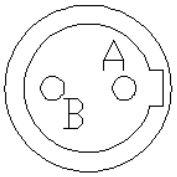
10 Gigabit fiber receptacle

The switch has 4 full duplex 1000Mbps fiber ports (13-16) and/or 2 full duplex 10000 fiber ports (17-18) available as singlemode or multimode. These ports will NOT auto-detect the speed and duplex of the connection. The ports can be disabled or configured for fixed settings via one of the management interfaces. See the software user manual for details.

10 Gigabit Receptacle

Fiber Receptacle Pinout



A = Receive into switch
B = Transmit out of switch

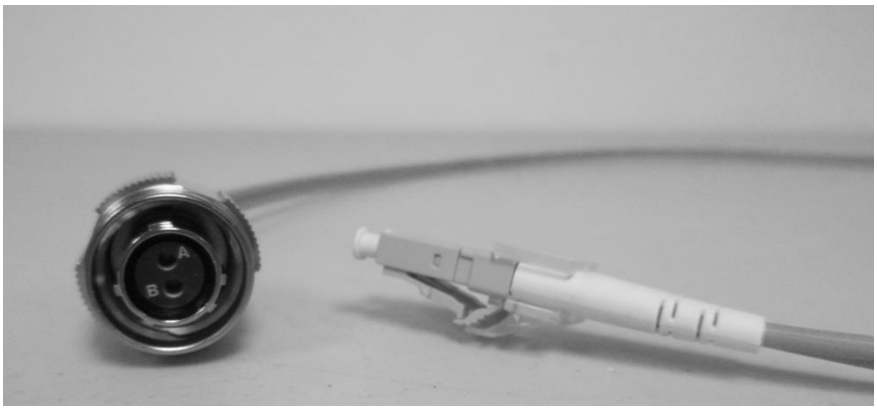
Receptacle:
Shell = 9, Insert = Fiber
Contacts = 2 pins (male), Keying = N

Recommended Plug

TE/Deutsch # **MC406E-N-09-2SN**

Note: This plug has a silver nickel plating. Contact TE for other plating options that may be used. The receptacles on the switch also have a silver nickel plating.

Typical 10 Gigabit fiber Plug



Section 4 LEDs

LED Location

The switch has a set of LEDs to indicate the status of various operating conditions as defined below.

Typical LED Location

Status LED

The Status LED indicates the overall health of the switch. It is normally ON solid green indicating that no internal CPU or software problems are detected. It will flash green when loading firmware and briefly on power up or reset. Otherwise, if it is OFF or amber for an extended period of time then a problem is detected. In this case, please contact technical support.

10G LED

The 10G LED indicates that the 10 Gigabit ports have power and are detected by the system. It is normally ON solid green. If this LED is OFF, please contact technical support.

Power LED

The Power LED will be on solid green when power is applied to the switch. In the event of a power fault, the LED will turn to solid amber. The LED will also be solid amber during a portion of the boot up sequence.

Ethernet LEDs

The switch has a set of LEDs to indicate the status of the Ethernet ports. Each LED is labeled with the number of the port it represents. They function as follows:

Solid Green = 1000 Mbps linked detected but no Ethernet activity.

Flashing Green = 1000 Mbps linked detected with Ethernet activity.

Solid Orange = 10/100 Mbps linked but no Ethernet activity.

Flashing Orange = 10/100 Mbps linked detected with Ethernet activity.

OFF = No link detected.

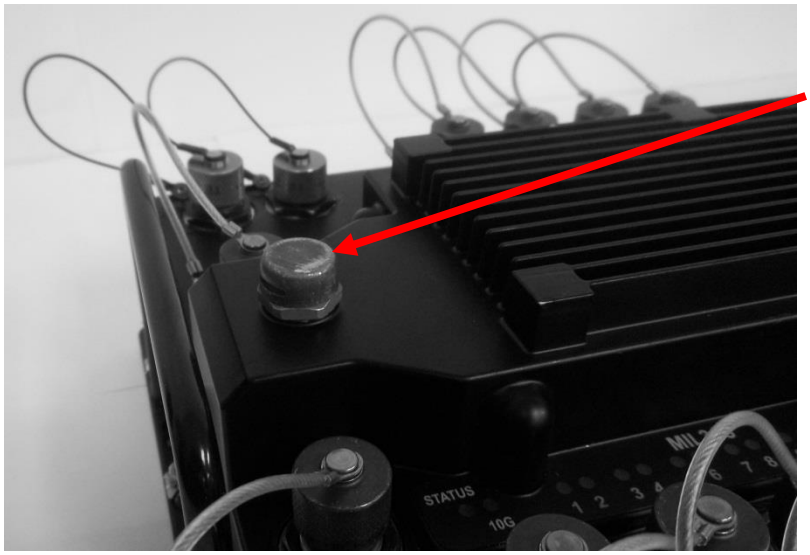
LED Blackout

The switch is equipped with the capability to toggle the LEDs from an active state to an inactive state. See **Console Receptacle Pinout** above or refer to the data sheet for more information.

Section 5

Pressure Vent

Without a pressure ventilation system the pressure differential that can occur due to temperature or altitude changes can result in condensation. To prevent this, the switch incorporates a pressure vent that adjusts the internal air pressure to match the surrounding (external) pressure. At the same time the vent is IP67 rated and will not let moisture into the switch.



Pressure Vent Characteristics

Air flow rate:	0,4 l/min at 0,1 bar ΔP to 5,0 l/min at 1 bar ΔP
Point of water entry:	> 1,5 bar
Temperature resistance:	–40°C to +120°C (in assembled state)

Section 6 Service Information

Service Information

We sincerely hope that you never experience a problem with any **Red Lion** product. If you do need service, call **Red Lion** at 1-877-432-9908 for Technical Support. A trained specialist will help you to quickly determine the source of the problem. Many problems are easily resolved with a single phone call. If it is necessary to return a unit to us, an RMA (Return Material Authorization) number will be given to you.

Red Lion tracks the flow of returned material with our RMA system to ensure speedy service. You must include this RMA number on the outside of the box so that your return can be processed immediately.

The applications engineer you are speaking with will fill out an RMA request for you. If the unit has a serial number, we will not need detailed financial information. Otherwise, be sure to have your original purchase order number and date purchased available.

We suggest that you give us a repair purchase order number in case the repair is not covered under our warranty. You will not be billed if the repair is covered under warranty.

Please supply us with as many details about the problem as you can. The information you supply will be written on the RMA form and supplied to the repair department before your unit arrives. This helps us to provide you with the best service, in the fastest manner. Normally, repairs are completed in two days. Sometimes difficult problems take a little longer to solve.

If you need a quicker turnaround, ship the unit to us by air freight. We give priority service to equipment that arrives by overnight delivery. Many repairs received by mid-morning (typical overnight delivery) can be finished the same day and returned immediately.

We apologize for any inconvenience that the need for repair may cause you. We hope that our rapid service meets your needs. If you have any suggestions to help us improve our service, please give us a call. We appreciate your ideas and will respond to them.

For Your Convenience:
Please fill in the following and keep this manual with your **Red Lion** system for future reference:

Serial #:_____ Date Purchased: _____

Purchased From:_____

Product Support

To obtain support for Red Lion products:

Latest product info: www.redlion.net

Phone: 1-877-432-9908

Fax: 1 (518) 877-8346

E-mail: support@redlion.net

Mailing address: Red Lion, 331 Ushers Road, Ballston Lake, NY 12019